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SOLAR OBSERVATIONS.

SOLAR AND SKY RADIATION MEASUREMENTS DURING AUGUST, 1921.

By HERBERT H. KIMBALL, Meteorologist.

For a description of instruments and exposures and an account of the method of obtaining and reducing the measurements the reader is referred to this REVIEW for April, 1920, 48.225.

From Table 1 it is seen that direct solar radiation intensities were close to normal August values at all the stations, and Table 2 shows that the total solar and sky radiation received on a horizontal surface was above the August normal, the excess averaging about 7 per cent at Washington and 4 per cent at Madison.

Skylight polarization measurements made on five days at Washington give a mean of 54 per cent and a maximum of 61 per cent on the 22d. At Madison, measurements obtained on 13 days give a mean of 57 per cent and a maximum of 70 per cent on the 8th. These are average values for August at Washington, but slightly below average at Madison.

TABLE 1.—Solar radiation intensities during August, 1921.

[Gram-calories per minute per square centimeter of normal surface.]

Washington, D. C.

		Sun's zenith distance.											
		8 a.m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	Noon.	
Date.	75th meri- dian time.	Air mass.										Local mean solar time.	
		A. M.					P. M.						
		e.	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0		e.
Aug. 3.....	mm.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	mm.		
9.....	17.96		0.58	0.75	0.99	1.32					18.58		
10.....	11.81					1.21					9.47		
15.....	14.60					1.15					12.68		
18.....	8.48							0.98			7.87		
19.....	16.79				1.05	1.21					14.10		
22.....	13.61				1.04	1.18					12.24		
26.....	8.81			0.91	1.09						8.48		
27.....	11.81	0.47	0.60	0.75		1.18					9.14		
30.....	10.97	0.61	0.72	0.85	1.00	1.30					8.48		
31.....	17.96				1.25	0.90	0.68	0.57	0.48		15.11		
Means	16.79				0.85	1.03					16.20		
Departures.		(0.54)	0.63	0.82	1.00	1.20	(1.02)	(0.83)	(0.57)	(0.48)			
		-0.03	+0.04	+0.07	+0.09	-0.03	+0.05	+0.03	-0.02	-0.04			

Madison, Wis.

Aug. 4	12.24				1.04	1.34				12.24
6	10.97		0.92		1.11	1.44				7.87
7	8.81				1.22					8.11
8	7.87				1.19					7.87
11	17.96				0.94					16.20
13	14.10					1.35	1.14	0.93		11.33
19	13.13		0.84		1.03	1.29				18.59
20	10.59		1.06		1.22	1.40				9.83
21	10.59		1.05		1.21					8.11
23	10.21				0.81	1.04				14.10
24	16.20					1.16	0.79	0.54		16.79
25	15.65					1.09	0.81			14.10
27	16.79					1.37				15.65
28	15.65			0.83		1.29				17.37
29	16.20					1.11				19.89
30	19.23		0.62		0.79	1.01				21.28
Means			0.90		1.04	1.24	0.91	0.74		
Departures			-0.02		-0.04	-0.06	-0.12	-0.11		

* Extrapolated.

TABLE 1.—Solar radiation intensities during August, 1921—Continued.

Lincoln, Nebr.

		Sun's zenith distance.												
		8 a.m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	Noon		
Date.	75th meri- dian time.	Air mass.										Local mean solar time.		
		A. M.					P. M.							
		e.	5.0	4.0	3.0	2.0	1.0	2.0	3.0	4.0	5.0		e.	
Aug. 3.....	<i>mm.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>mm.</i>		
8.....	11.39			0.75	1.15							13.39		
9.....	10.97			1.03	1.19			0.90	0.78	0.65		16.20		
11.....	13.61		0.73	0.84	0.98	1.29						21.28		
12.....	15.11							0.79	0.68			15.11		
17.....	13.61				1.03		1.00	0.82	0.70	0.60		18.59		
18.....	12.24		0.77	0.98	1.17	1.36	1.11	0.92	0.80	0.64		13.61		
19.....	12.68		0.79	0.93	1.13	1.28	1.05	0.88	0.69	0.63		17.96		
22.....	17.37					1.35	1.05	0.82	0.65	0.57		14.60		
24.....	19.89					1.30	0.99	0.91	0.69	0.56		17.37		
25.....	5.26		0.70	0.84	1.04	1.27	0.90	0.73				19.89		
27.....	17.96					1.39	1.07	0.89	0.76	0.65		20.57		
31.....	16.20					1.41						18.59		
Means.....			0.75	0.89	1.10	1.33	1.02	0.85	0.72	0.61				
Departures.....			-0.04	+0.00	+0.03	-0.01	-0.07	-0.05	-0.04	-0.08				

Santa Fe, N. Mex.

Aug. 10.....	9.14				1.48						9.14
17.....	6.70		1.11	1.23	1.36	1.51					6.27
20.....	9.14	0.94	1.04								9.83
22.....	8.18		1.08								8.18
25.....	9.47		1.00	1.11	1.26						8.48
26.....	7.57		1.02	1.15	1.30	1.47					7.29
27.....	7.29	0.86	0.98	1.12	1.27	1.46					7.87
Means.....		(0.90)	1.04	1.15	1.30	1.48					
Departures.....		-0.02	+0.05	+0.05	+0.05	+0.03					

TABLE 2.—Solar and sky radiation received on a horizontal surface.

Week beginning.	Average daily radiation.			Average daily departure for the week.			Excess or deficiency since first of year.		
	Wash- ington.	Madison.	Lincoln.	Wash- ington.	Madison.	Lincoln.	Wash- ington.	Madison.	Lincoln.
July 30.....	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.
Aug. 6.....	486	460		+ 12	-16		+ 635	-4,341	
Aug. 13.....	491	466		+ 31	+ 6		+ 852	-4,298	
Aug. 20.....	410	492		- 1	+47		+ 848	-3,966	
Aug. 27.....	543	439		+123	+14		+1,706	-3,870	
Aug. 27.....	467	406		+ 60	+ 2		+2,128	-3,855	

MEASUREMENTS OF THE SOLAR CONSTANT OF RADIATION AT CALAMA, CHILE, JUNE AND JULY, 1921.

By C. G. ABBOT, Assistant Secretary.

[Smithsonian Institution, Washington, Sept. 29, 1921.]

In continuation of preceding publications, I give in the following table the results obtained at Montezuma, near Calama, Chile, in June and July, 1921, for the solar constant of radiation. The reader is referred to this REVIEW for February, August and September, 1919, for statements of the arrangement and meaning of the table.

It will be noted that in contrast to the June and early July values the observations reported from July 9 to

July 25, inclusive, are almost invariably unusually high. As no results were reported between July 3 and July 9, it does not appear when this period of high values actually commenced. These facts are noted because the writer has been repeatedly asked by interested parties whether there was anything in the solar constant values of the past summer corresponding to the march of temperatures observed in the United States.

Date.	Solar constant.	Meth. od.	Grade.	Trans- mission coefficient at 0.5 micron.	Humidity.			Remarks.
					p/psc	V. P.	Rel. hum.	
1921. P. M. June 4	cal. 1.945 1.942 1.943	M _{1.40} M _{1.42} W. M.	S	0.886	0.816	cm. 0.11	Per cent. 7	
7	1.914	M _{1.48}	S—	.889	.877	.11	5	
8	1.938 1.938 1.938	M _{1.48} M _{1.48} W. M.	S	.886	.828	.06	2	Thin cirri all morn- ing.
A. M.								
9	1.967 1.928 1.914 1.932 1.951 1.938	F ₀ M _{1.48} M _{1.48} M _{1.48} M _{1.48} W. M.	VG	.875	.758	.04	4	
P. M.								
11	1.927 1.931 1.929	M _{1.48} M _{1.48} W. M.	S	.880	.590	.20	8	Cumuli over high peaks.
13	1.937	M _{1.48}	S—	.883	.634	.20	12	Cirri in east and low in west.
18	1.951 1.949 1.950	M _{1.48} M _{1.48} W. M.	S—	.883	.778	.18	13	Some cirri in north and east.
A. M.								
19	1.930 1.929 1.929	M _{1.48} M _{1.48} W. M.	S	.881	.585	.24	29	Clouds over high peaks.
P. M.								
20	1.933	M _{1.48}	S—	.883	.579	.21	14	
21	1.942	M _{1.48}	S—	.882	.640	.23	11	Cirri scattered about sky.
22	1.948 1.960 1.955 1.930 1.950	M _{1.48} M _{1.48} W. M. M _{1.48} M _{1.48}	S—	.880	.642	.28	15	Heavy cirri in north and east.
24	1.943 1.938 1.941 1.940	W. M. M _{1.48} M _{1.48} W. M.	S	.880	.614	.22	17	Little cirri over high peaks.
A. M.								
26	1.949 1.935 1.941	M _{1.48} M _{1.48} W. M.	S	.886	.809	.13	10	
P. M.								
27	1.950 1.933 1.940	M _{1.48} M _{1.48} W. M.	S—	.885	.746	.11	6	
28	1.946 1.946 1.938 1.944	M _{1.48} M _{1.48} M _{1.48} W. M.	S	.885	.739	.09	5	Thin cirrus in morn- ing.
A. M.								
29	1.950 1.955 1.952	M _{1.48} M _{1.48} W. M.	S	.885	.803	.10	6	

Date.	Solar constant.	Meth. od.	Grade.	Trans- mission coefficient at 0.5 micron.	Humidity.			Remarks.
					p/psc	V. P.	Rel. hum.	
1921. P. M. July 1	cal. 1.935 1.937 1.948	M _{1.48} M _{1.48} M _{1.48}	S—	0.885	0.781	cm. 0.07	Per cent. 4	Thin cirri in morn- ing.
2	1.939 1.943 1.941 1.955 1.946	W. M. M _{1.48} M _{1.48} M _{1.48} W. M.	S	.886	.770	.07	4	Heavy cirri low in north, east, and west.
A. M.								
3	1.944 1.953 1.947	M _{1.48} M _{1.48} W. M.	S—	.886	.824	.05	4	Cirri in north and east.
P. M.								
9	1.960 1.958 1.959	M _{1.48} M _{1.48} W. M.	S	.886	.872	.11	5	
10	1.966 1.955 1.969 1.964	M _{1.48} M _{1.48} M _{1.48} W. M.	S	.885	.785	.15	7	Thin cirri in morn- ing.
A. M.								
11	1.930 1.927 1.954 1.936	M _{1.48} M _{1.48} M _{1.48} W. M.	S—	.883	.727	.08	7	Little cirri in south, and forming in north and west during last obser- vation.
13	1.951 1.951 1.951	M _{1.48} M _{1.48} W. M.	S	.878	.735	.52	9	
P. M.								
14	1.955 1.952 1.956 1.954	M _{1.48} M _{1.48} M _{1.48} W. M.	S	.882	.758	.18	9	
A. M.								
15	2.017	F ₀	E—	.869	.427	.18	18	Heavy cumulus in east, and some in north and west.
P. M.								
20	1.946 1.957 1.952	M _{1.48} M _{1.48} W. M.	S—	.884	.774	.16	10	Thick cumulus in north and east.
A. M.								
21	1.952 1.964 1.961 1.959	M _{1.48} M _{1.48} M _{1.48} W. M.	S	.885	.779	.15	7	
22	1.946 1.955 1.950 1.951 1.951	M _{1.48} M _{1.48} M _{1.48} W. M. W. M.	S	.884	.773	.10	5	
25	1.951 1.951 1.951 1.951 1.951	M _{1.48} M _{1.48} M _{1.48} W. M. W. M.	S	.886	.819	.27	11	
26	1.924 1.925 1.925 1.925	M _{1.48} M _{1.48} M _{1.48} W. M.	S	.884	.677	.32	14	Clouds in west and east.
27	1.912 1.923 1.921	M _{1.48} M _{1.48} W. M.	S—	.872	.643	.22	9	
28	1.955	M _{1.48}	S—	.880	.733	.18	8	
P. M.								
29	1.941 1.958 1.949	M _{1.48} M _{1.48} W. M.	S	.884	.778	.32	13	Cumuli over high peaks. Some cirri in south.
A. M.								
31	1.938 1.820 1.938	M _{1.48} M _{1.48} W. M.	VG	.877	.675	.33	23	Some cirri over high peaks.